

REMARKS

Applicant's counsel thanks Examiner Cooney for a careful examination of the present application. Herein, the claims have been amended to more clearly set forth what is being claimed as more fully explained below. Basis for amendments to the specification and to the claims is also set forth below. Claims 38 and 50 have been canceled without prejudice as explained below.

Claims 66-67 have been rejected under 35 USC § 112, first paragraph as failing to comply with the written description requirement. The specification has now been amended at paragraph [0048] to incorporate the substantive disclosure contained in these claims. Contrary to the Examiner's indication that these claims constitute new matter, basis for them is clearly found in Fig. 1. In that figure, the left end of the "invented" curve clearly indicates that on impact with a flat circular impactor having a 4-inch diameter at an impact speed of 'about' 2 meters per second (abscissa axis), a sample of the "invented" foam measuring 5.5" x 5.5" x 1" thick exhibits 'about' 100 g's of breakthrough acceleration" (ordinate axis). (See specification at paragraph [0048], discussing the results in Fig. 1, for basis regarding the circular impactor and sample of foam having the recited dimensions). The "about" language is proper in claim 66 because the left end of the curve is not exactly or precisely at the intersection of 2 m/s and 100 g's acceleration on the graph, but it is clearly "about" at that location. A person having ordinary skill in the art viewing Fig. 1 would have no trouble recognizing that at the time the application was filed, applicant was in possession of, and had disclosed, the invention whereby using an impactor and foam sample as above-described, "about" 100g's of breakthrough acceleration are experienced for an impact velocity of "about" 2 meters per second. Thus, Fig. 1 in combination with paragraph [0048] as-filed clearly support claim 66, and the corresponding disclosure now incorporated into the specification.

Regarding claim 67, , Fig. 1 also provides clear basis for this claim and the

corresponding amendment to the specification at paragraph [0048]. The "invention" curve in Fig. 1 (same curve discussed in the preceding paragraph) clearly passes through "about" the intersection of 6 meters per second (abscissa axis) and 150 g's acceleration (ordinate axis). Again, "about" here is proper because that curve does not necessarily precisely pass through the intersection of these lines, but a person having ordinary skill in the art, viewing Fig. 1, would have no trouble recognizing that applicant was in possession of, and disclosed, a foam having the recited physical properties. In view of the foregoing, the Section 112, first paragraph rejections of claims 66-67 have been overcome.

The Examiner has rejected claim 66 under 35 USC § 112, second paragraph on the ground that the term "negligible" renders the claim indefinite because "the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention." Respectfully, the rejection is traversed. Claim 66 specifies that the sample of foam exhibits "negligible loss of strength following said 2 m/s impact." 'Negligible' will be understood by the person having ordinary skill in the foam art in the context presented, to indicate that the foam retains substantially all its strength; i.e. a 'negligible' loss of strength, under the stated conditions. Mathematical precision is not required. All that is required is that a person having ordinary skill in the art, in view of the specification, would understand the scope of the claimed invention. Here, that threshold has been met, as such an artisan would recognize that any loss of strength according to claim 66 is so small and insignificant as may be disregarding when reporting or measuring the strength of the foam. Indeed, Random House Unabridged Dictionary (available online at www.dictionary.com) defines 'negligible' as follows: so small, trifling, or unimportant that it may safely be neglected or disregarded." Respectfully, the term 'negligible' in the context of claim 66 is sufficiently clear to convey to the skilled artisan the claim's scope. The Examiner is respectfully requested to reconsider and withdraw

this rejection.

Claim 67 has also been rejected under 35 USC § 112, second paragraph on the ground that,

Claim 67 recites the foam of claim 66, and employment of the term "said" does not serve the effect of implying all of the conditions recited in claim 66 that are not mentioned in claim 67.

Office action, p. 4 (emphasis original).

The rejection is respectfully traversed. Claim 67 says, "on impact with said flat circular impactor at an impact speed of about 6 meters per second, said foam sample exhibits about 150 g's of breakthrough acceleration." The scope of the claim is clear. Claim 67 simply says that the same sample of foam as in claim 66 (i.e. having the same measurements) will exhibit the recited breakthrough acceleration at the recited impact speed using the same flat circular impactor as in claim 66. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this rejection.

Claims 35-67 have been rejected under 35 USC § 112, first paragraph, as failing to comply with the written description requirement on the ground that numerous ranges mentioned throughout the claims were not sufficiently described in such a way as to convey to a person having ordinary skill in the art that applicant was in possession of the specified ranges at the time the application was filed. The rejection identifies some ranges as "most notably" lacking support, but implies there may be more ranges felt by the Examiner to lack support. Accordingly, following is a detailed explanation of where each recited numerical range finds basis in the application as-filed, and in appropriate cases an explanation of support for corresponding amendments to the specification to provide written-description support. Also in appropriate cases, amendments to the claims are described, as well as the basis therefor in the specification as-filed.

Claims 35 and 54

Basis for all ranges recited in claims 35 and 54 is found in paragraphs [0007] and [0009] of the PCT specification as-filed. In addition, claims 1 and 16 of the PCT application as-filed also provide support for all ranges recited in present claims 35 and 54.

Claims 37 and 56

Paragraph [0040] as-filed provides that “[p]referably, the Part A and Part B compositions are combined to provide an index of 60-130, preferably 65-115.” In addition, paragraph [0018] provides that “[a]s used herein, when a range such as 5-25 (or 5 to 25) is given, this means preferably at least 5 and, separately and independently, preferably not more than 25.” In claims 37 and 56, specifying the index is “60-115” is an expedient to saying the index is ‘at least 60 and not more than 115.’ Accordingly, the specification provides written description support for the index range recited in claims 37 and 56, including the “60-” portion of that range in claim 37 specified by the Examiner at the top of page 4 of the Office action. Finally, claims 3 and 18 of the PCT application as-filed also provide support for this range.

Claim 38

This claim has been canceled herein without prejudice, thus mooted the rejection.

Claims 39 and 57

These claims provide that the Part B composition comprises “about 1-3 parts by weight water.” The specification has now been amended at paragraph [0033] to provide written-description support for this specific part-by-weight range of water. Basis for this amendment to the specification can be found in claims 5 and 19 of the PCT application as-filed.

Claims 40 and 58

These claims provide that the Part B composition comprises "about 1-6 parts by weight black paste." The specification has now been amended at paragraph [0034] to provide written-description support for this specific part-by-weight range of black paste. Basis for this amendment to the specification can be found in claims 6 and 20 of the PCT application as-filed.

Claims 42 and 60

These claims specify that 4,4'-MDI is present "in said Part A composition in an amount sufficient to provide an isocyanate (NCO) concentration of about 33.6 percent by weight." Basis for these limitations can be found in the specification at paragraph [0036], and also in claims 8 and 22 of the PCT application as-filed.

Claim 43

This claim specifies that the isocyanate in the Part A composition is "present in the form of an allophanate-modified MDI prepolymer, said part A composition having an isocyanate (NCO) concentration of about 20-30 percent by weight." Basis for these limitations can be found in the specification at paragraph [0037], and also in claim 9 of the PCT application as-filed.

Claims 44 and 62

Each of these claims recites 0-10 parts by weight monoethanolamine-based polyol, 10-70 parts by weight triethanolamine-based polyol and 0-36 parts by weight ethylenediamine-based polyol. Basis for all these ranges can be found in the specification as follows. Paragraph [0023] expressly recites the "10-70" and "0-36" ranges in these claims. Regarding the 0-10 parts by weight monoethanolamine-based polyol, paragraph [0023] states that this polyol is present "in the following preferred

parts by weight: ...0-15,...preferably 8-10....” As noted above, paragraph [0018] explains that a range such as 5-25 (or 0-15 or 8-10 as here) in the specification is to be construed as “preferably at least 5 [or in this case 0 or 8] and, separately and independently, preferably not more than 25 [or in this case 15 or 10].” Writing the monoethanolamine-based polyol concentration in these claims as “0-10 parts by weight” is simply an expedient for saying ‘at least 0 and not more than 10 parts by weight.’ Accordingly, there is written-description support for this range in the specification. Finally, clear support is also found in claims 10 and 24 of the PCT application as-filed.

Claim 45

This claim recites 0-2.5 parts by weight amine catalyst, 0-1 parts by weight delayed action catalyst, and 0-1 parts by weight trimerization catalyst. All three of these ranges find support in paragraph [0031] of the specification, as well as in original claims 11 and 25 of the PCT application as-filed.

Claim 50

This claim specified the Part B composition has “100 parts by weight total polyols.” This limitation has support in the specification at paragraph [0035]. This feature has now been incorporated into independent claim 35, and claim 50 has therefore been canceled.

Claims 51 and 63

These claims previously recited “60-70” parts by weight triethanolamine-based polyol and “30-40” parts by weight of “said additional polyol.” These claims have now been amended to specify “60 or 70” and “30 or 40” parts by weight, respectively. Basis for these values can be found in Table 4, where the triethanolamine-based polyol in the listed examples is present in the Part B composition in amounts of 60 parts by weight

(Foams 12-15) or 70 parts by weight (Foams 9-10); and the unfilled or filled polyol (*cf.* "other polyol" in claims 51 and 63) is present in either 30 parts by weight or 40 parts by weight for the same Foams.

Claims 52 and 64

These claims specify that the "one or a mixture of propylene oxide-extended amine-based polyether polyols [from the antecedent claim] further compris[es] monoethanolamine-based polyol in an amount of 8-10 parts by weight." Basis for this range can be found similarly as in claims 44 and 62 discussed above.

Claims 35-67 have been rejected under 35 USC § 112, second paragraph as being indefinite on the ground that:

Applicants' claims recite numerous ranges of parts by weight and weight percent values but do not recite what these ranges of values are based upon. Accordingly, the claims are confusing as to intent.

Office action, p. 6.

Applicant disagrees that the meaning of any claim is unclear based on the weight percents or parts by weight recited in them. However, to expedite prosecution applicant has amended independent claims 35 and 54 to clearly state that "all values expressed as weight percents are based on the total weight of the Part A composition, and all parts by weight are parts by weight of the Part B composition." It is believed this was already inherently understood throughout the claims, and express basis for this limitation can be found throughout the specification; for example in paragraph [0019] discussing Table 1, which lists components in the Part A and Part B compositions. Accordingly, this rejection is respectfully submitted to be overcome.

In view of the foregoing, all Section 112 rejections are now believed to be overcome. Applicant turns now to the art-based rejections contained in the Office

action.

The Examiner has rejected all claims under 35 USC § 103(a) as being obvious over each of the following references: Apichatachutapan et al. (hereafter "Api"), Lutter et al. (hereafter "Lutter") and Falke et al. (hereafter "Falke"). The rejections are respectfully traversed for the following reasons.

The Section 103 rejections based on each of the three references are nearly identical. All three rejections argue that the respective reference:

- discloses polyurethane foam preparations wherein isocyanates are reacted with polyol compositions including polyether polyols;
- discloses the polyether polyols can be based on glycerols, amines, alkanolamines, and other initiators;
- discloses that the isocyanates and polyols can be combined at an index defined by the claims, in the presence of water;
- discloses various catalysts encompassing those claimed; and
- discloses additives encompassing those claimed.

Office action, pp. 4, 7 and 9.

The Section 103 rejections over each reference further state that particular impact and strength properties as-claimed are not seen to distinguish the respective reference "based on the materials and make-ups of the preparations claimed." Office action, p. 6.

The Section 103 rejections over each reference further state the respective reference "provides disclosure of glycerine-based polyether polyols and NCO indexes as claimed and distinction based on these elements is not seen." Office action, pp. 6, 8 and 10.

In each case, the Examiner further states that the reference:

differs from applicants' claims in that it does not specifically require that amine-based polyether polyols be employed in their preparations.

However, [the reference, Api, Lutter and Falke] does recite that amine initiators[, and, particularly, the specific amines of applicants claims,]¹ can be used in the practice of their invention for the purpose of providing adequate isocyanate reactive components.... Accordingly, it would have been obvious for one having ordinary skill in the art to have employed the amine initiators disclosed by [the reference, Api, Lutter and Falke] in the preparations [of that reference] in blended combinations for the purpose of providing their isocyanate reactive effect in the preparations of [the reference, Api, Lutter and Falke] in order to arrive at the products and/or processes of applicants' claims with the expectation of success in the absence of a showing of new or unexpected results.

Office action, pp. 6 (Api), 8 (Lutter) and 10 (Falke).

Initially, like the present claims it is acknowledged that all three references, Api, Lutter and Falke, are directed to compositions for polyurethane foams for different purposes. All polyurethane foams are formed by reacting one or more polyether polyols with isocyanate in some form or forms. These broad classes of components, together with catalysts, blowing agents, pigments and other additives are the basic building blocks of all polyurethane foams. However, the knowledge that all these classes of components exist, of every single example in each class, and that they can be combined variously to experiment with different polyurethane foam formulations, does not render obvious any particular polyurethane foam composition, including that presently claimed.

Independent claims 35 and 54 have been amended to make clear that the foams claimed are semi-rigid viscoelastic foams. None of the cited references remotely suggests a semi-rigid viscoelastic foam made from a mixture of polyols containing propylene oxide extended amine-based polyol(s) that are substantially free of ethylene oxide extension units, in the proportion claimed. Instead, those references are all directed to flexible or soft polyurethane foams for various purposes. Like most patents in this field, each of them describes the particular composition with which it is concerned, but also provides vast laundry lists of potential candidates of every kind and

¹ The bracketed portion here is said in connection with Api and Falke only.

description for the various classes of components that can go into polyurethane foams, e.g., polyols, their initiators, hydroxyl numbers, molecular weights, extension species, isocyanates, catalysts, chain extenders, etc., with no regard to whether, how or why one would, should or even could prepare a polyurethane foam from every possible combination of all these components to achieve any particular result.

Submitted herewith is the Declaration of Charles M. Milliren, Ph.D., the inventor of the present application. In his declaration, Dr. Milliren explains that the specific chemical components that make up a polyurethane foam are outcome-determinative of the foam's properties. Milliren, ¶ 8. Dr. Milliren further explains that the presentation to the skilled artisan of vast lists contained in the three cited references, which recite numerous species for the different classes of components typically found in polyurethane foams, does not suggest to the skilled artisan to select and combine particular ones of those species to achieve a foam having any particular characteristics, such as the semi-rigid viscoelastic foams now claimed. Milliren, ¶ 23.

As noted above, the Examiner has acknowledged that none of the references discloses the amine-based polyether polyols as now claimed. But the Examiner then concludes it would nonetheless have been obvious to select "the amine initiators [of the present claims] in blended combinations for the purpose of providing their isocyanate reactive effect in the preparations of [the reference] in order to arrive at the products and/or processes of applicants' claims with the expectation of success in the absence of a showing of new or unexpected results."

Respectfully, aside from the fact that the reactivity of amine-based polyols would counsel against using them in the reference compositions, or even in those claimed (explained below), Dr. Milliren explains that the compositions claimed do result in quite a surprising result; namely in a polyurethane foam that has, in combination, all of the following properties:

- semi-rigid foam exhibiting comparable performance to EPS following high-speed impact (6.23 m/s) using a rigid spherical or circular impactor under the conditions disclosed in the specification;
- viscoelastic foam that behaves comparably to a flexible foam for relatively low-speed impacts (e.g. 2 m/s) using the impactors and conditions disclosed in the specification;
- a foam that substantially recovers following high speed impact;
- a foam that following recovery, exhibits negligible loss in strength and its ability to absorb another high-speed impact (6.23 m/s) using the impactors and conditions disclosed in the specification;

all in a single foam that incorporates a substantial proportion (≥ 10 parts by weight, out of a total of 100 parts by weight) of amine-based polyether polyols that are propylene-oxide extended and have substantially no ethylene oxide extension units. Milliren, ¶ 20. The presence of all these properties in combination, in a single foam made using the amine-based polyols as-claimed, having the specific chemistry (substantially no ethylene oxide extension units) as claimed "was an incredibly surprising and unexpected result, which could not have been predicted a priori by a person having ordinary skill in the art who has had placed in front of him every conceivable species of isocyanate, polyol initiator, polyol extension unit, catalyst, filler, etc. that has ever been used or could be used to prepare any polyurethane foam, with no guidance how to combine them or in what proportions, or even what the properties of the ultimate foam should be." *Id.*

Looking rigorously at the three applied references, none of them suggests or implies using amine-based polyols that are propylene-oxide extended and have substantially no ethylene oxide extension units as claimed. Certainly none of them suggests using such amine polyols, in the proportions claimed, to produce a semi-rigid viscoelastic foam having the properties recited above.

The Examiner has argued, for all three references, that the reference's "preparations exhibit impact and strength properties which are not seen to differentiate from those of applicants' claims based on the materials and make-ups of the preparations claimed." However, this conclusory statement is not based on a

comparison of what the references actually teach to the compositions claimed (claims 35 and 54), or to the properties of the claimed foams (claim 66) as disclosed in the present specification. Listing every class of ingredient that might be combined to produce a viscoelastic foam does not constitute a teaching or suggestion to select and combine particular ones of those ingredients, modified as claimed and in the particular proportions claimed, to produce a foam having the surprising properties as applicant has discovered. Moreover, a review of the references does not reveal any teaching or suggestion of any foam having those properties.

Turning to the Examiner's motivation to make the claimed foams, in view of the endless lists of possible components mentioned in the three references, it is respectfully submitted that the random chance of forming the claimed foams, having their unexpected properties, is not a sufficient reason to render those foams obvious. What is utterly missing from any of the references, from the knowledge available to the person having ordinary skill in the art without applicant's claims in view, and from the Examiner's analysis, is a correct reason or motivation to make the applicant's claimed composition. The reasoning given by the Examiner to incorporate the amine-based polyols as claimed is actually a reason not to use those polyols in the compositions disclosed in the references.

As noted above, the Examiner has said that "providing their isocyanate reactive effect" is a reason to use amine initiators (to provide amine-based polyols) in place of the initiators used in all three references. Office action, pp. 6 (Api), 8 (Lutter), 10 (Falke). It is true that amine-based polyols, prepared using amine initiators, are more reactive than other polyols. Milliren, ¶ 24. However, more reactive polyols result in higher cross-linking rates, which "typically result in much stiffer, more rigid foams as known in the art." *Id.* (emphasis added). "Therefore, the high reactivity of amine-based polyols cited by the Examiner is actually a reason not to use them in any of the references (certainly in the proportions claimed), which all clearly are directed to flexible or soft foams as noted above." *Id.* Moreover, using such polyols in the claimed proportions, a person of ordinary skill in the art would not have a reasonable expectation of success to prepare a semi-rigid viscoelastic foam that is recoverable (i.e. not irreversibly crushed) following deformation, a property of the claimed foams. *Id.*

Turning more specifically to the references, nothing in Api fairly or even remotely suggests preparing a semi-rigid viscoelastic foam, particularly one made using the proportions of amine-based polyols, particularly propylene oxide extended amine-based polyols having substantially no ethylene oxide extension units, as claimed. As evidenced by its Examples, Api discloses soft flexible foams made to be flame-retardant. One of ordinary skill in the art would not think to use 1) amine-based polyols in the claimed proportions that 2) have substantially no ethylene oxide extension units to prepare such foams for the reasons explained above, as well as in the Milliren Declaration (e.g., Milliren, ¶ 9-10, 12, 16). Starting from Api, one would not have been motivated, nor would he have expected to achieve a successful result, to prepare a semi-rigid viscoelastic (recoverable) foam from a polyol composition comprising amounts of amine-based polyols as claimed, and particularly propylene oxide extended amine-based polyols having substantially no ethylene oxide extension units.

In this regard, Api recognizes that based on the virtually unlimited number of possible ingredients (e.g. as listed in that reference), "making viscoelastic foam hinge[s] on finding the right mixture of polyether polyols and other components." See Api, para. [0010]. The fact that Api mentions amine-based initiators at all is the result of mere laundry listing of virtually every conceivable initiator molecule that ever has been or possibly might be used to make virtually any polyurethane foam, with no regard whatsoever to if, how or when such amine initiators are, can or should be used. Such laundry listing, even in a single reference, does not suggest to the skilled artisan how to select particular subsets of the listed ingredients to arrive at the present claims. Milliren, ¶ 25. See *In re Kotzab*, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000), (reversed examiner's holding and Board of Appeals' affirmation of obviousness based on the combination of disparate statements in a single reference to suggest obviousness, because there was no suggestion to combine the disparate statements).

In *Kotzab*, the Federal Circuit held:

Most if not all inventions arise from a combination of old elements. See *In re Rouffet*, 149 F.3d 1350, 1357, 47 U.S.P.Q.2D (BNA) 1453, 1457 (Fed. Cir. 1998). Thus, every element of a claimed invention may often be found in the prior art. See *id.* However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. See *id.* Rather, to establish obviousness based on a

combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the applicant. See *In re Dance*, 160 F.3d 1339, 1343, 48 U.S.P.Q.2D (BNA) 1635, 1637 (Fed. Cir. 1998); *In re Gordon*, 733 F.2d 900, 902, 221 U.S.P.Q. (BNA) 1125, 1127 (Fed. Cir. 1984). Even when obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference. See *B.F. Goodrich Co. v. Aircraft Braking Sys. Corp.*, 72 F.3d 1577, 1582, 37 U.S.P.Q.2D (BNA) 1314, 1318 (Fed. Cir. 1996).

Id. at 1369-1370 (emphasis added).

Moreover, *Kotzab* recognized that such suggestion or motivation "may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved. *** In addition, the teaching, motivation or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references." *Id.* at 1370. Hence, *Kotzab* is in accord with *KSR Int'l Co. v. Teleflex, Inc. et al.*, 550 U.S. 398, which held the Federal Circuit's strict reliance on the teaching-suggestion-motivation test for obviousness was improper when constrained to only the references themselves. Under *KSR* and *Kotzab*, there is still an indispensable requirement of motivation to combine prior art teachings, even from the same reference, which motivation may come from the references themselves, the knowledge of a person having ordinary skill in the art, or any other objective source other than the applicant's claims. 217 F.3d at 1379 ("A critical step in analyzing the patentability of claims pursuant to section103(a) is casting the mind back to the time of the invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. *** Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher.") (internal citations, quotations omitted).

Similarly as in *Kotzab*,

[t]he idea of [using amine initiators in place of those actually used in *Api* or the other applied references] is a technologically simple concept. With this simple concept in mind, the Patent and Trademark Office found prior art

statements [amine initiators contained in laundry lists of every kind of potential polyol initiator] that in the abstract appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of [applicant's] invention to make the combination in the manner claimed.

Id. at 1371-1372.

Separately, one of ordinary skill in the art also would not consider using the amine-based polyols having substantially no ethylene oxide extension units as claimed in the flexible foam compositions of Api and the other references, particularly in the claimed proportion, because the skilled artisan would not expect to produce a flexible foam this way; the increased reactivity for amine-based polyols noted by the Examiner actually leads to the opposite expectation. Further still, he would not even expect to produce the claimed semi-rigid viscoelastic foam, which is recoverable after deformation.

All three references lack any motivation (and any reasonable expectation of success) to prepare the claimed composition having "at least 10 parts by weight [out of 100 parts total polyols] of one or a mixture of propylene oxide-extended amine-based polyether polyols having substantially no ethylene oxide extension units." Nor has the Examiner identified a reasonable motivation from any other source to select from among the near-infinite possible combinations of ingredients in Api (and the other references) to produce the claimed composition. The lack of any such motivation is further emphasized by the extremely surprising and unexpected results obtained for the semi-rigid viscoelastic foams in the application. As explained by Dr. Milliren:

The present invention is based on the extremely surprising result that the combination of a substantial amount of an amine-based polyether polyol, or a mixture of such polyols, that is/are propylene oxide extended, together with at least one other filled and/or unfilled polyether polyol and an appropriate amount of isocyanate as well as with other component(s) as claimed, produces a semi-rigid viscoelastic foam that has proven very effective to attenuate impact force across a very wide range of dynamic impact speeds; e.g. ranging from 2-6 meters per second, or broader. This result was particularly surprising because amine-based polyols are usually considered to be rigid foam precursors, and it was quite surprising that the use of such polyols, in relatively significant amounts with other polyols, and particularly having substantially no ethylene oxide extension units,

would produce such effective ***semi-rigid*** foams that are so well suited to dynamic impact energy attenuation applications, yet still recover following an impact. Even more surprising was the breadth of impact speeds over which impact force could be effectively attenuated using these foams compared to a conventional rigid foam such as EPS, as seen in the Examples in the application.

Milliren, ¶ 16 (emphasis original).

As Dr. Milliren further points out in his declaration at ¶¶ 18-19, Examples in the present application present data comparing the present foam to conventional rigid polystyrene (the closest prior art), and demonstrating the foam's surprising and unexpected effectiveness to attenuate dynamic impact forces across a broad range of impact speeds, including comparable or even better performance than rigid polystyrene for high velocity (6.23 m/s) impacts. That a semi-rigid foam **1)** prepared using propylene oxide extended amine-based polyols having substantially no ethylene oxide extension units, **2)** is effective to attenuate such high velocity impacts despite being a semi-rigid and not a rigid foam, and **3)** is yet recoverable and reusable following impact, was a highly surprising and unexpected result that does not directly flow from anything disclosed in Api. *Id.* at 20.

The same reasoning as above is applicable with equal force against the rejections over both Falke and Lutter. Both these references are directed, explicitly, to flexible foams (Lutter, col. 4, line 45 and col. 8, line 50; Falke, col. 1, line 5), and each is directed to particular applications for which such flexible foams are well suited. Milliren, ¶¶ 13-14. Also, like Api, both Falke and Lutter contain vast laundry lists of potential candidate species of every kind and description for the various components that can go into polyurethane foams, with no hint or suggestion how, whether or why one can or should prepare all possible combinations of all species for all components. Absolutely no hint or suggestion is to be found in either Falke or Lutter to prepare a semi-rigid foam, particularly using the proportion of propylene oxide extended amine-based polyols having substantially no ethylene oxide extension units as claimed, which foam

has been found surprisingly and unexpectedly to be very well suited to dynamic impact force attenuation across a broad range of impact speeds. Under *Kotzab* discussed *supra*, it cannot be considered obvious to select from among the numerous ingredients in these vast lists to arrive at applicant's claims.

Indeed, *Api* acknowledges the unpredictability of preparing viscoelastic foams having certain properties when choosing from the near-infinite range of available ingredients, noting that preparing such viscoelastic foams "hinge[s] on finding the right mixture of polyether polyols and other components." *Api*, para. [0010]. Moreover, the unexpected results obtained from the present foams, discussed above and in the *Milliren* Declaration, make the appropriate selection from the numerous ingredients in *Api*, *Lutter* and *Falke* even less obvious.

Accordingly, the compositions specified in claims 35 and 54², both of which require at least 10 parts by weight of one or a mixture of propylene oxide-extended amine-based polyether polyols that have substantially no ethylene-oxide extension units, are not rendered obvious over any of the references of record. Nor is a semi-rigid viscoelastic foam that is substantially 100% recoverable and exhibits negligible loss of strength following impact under the conditions specified in claim 66 fairly suggested by or obvious over any of those references. For these reasons, the rejections of claims 35, 54 and 66 are respectfully submitted to be overcome. All remaining claims are dependent claims. For these reasons, all claims are now believed to be in condition for allowance.

² Claim 54 is a method claim, but it incorporates the specified limitations regarding the amine-based polyether polyol(s).

Request for Telephone Interview

Should the Examiner have any questions regarding this submission, or should there remain any concerns regarding the patentability of any claims after reviewing the same, the Examiner is invited and requested to please contact the undersigned at the phone number provided below prior to the issuance of a further Office action.

If there are any additional fees resulting from this communication, please charge same to our Deposit Account No. 16-0820, our Order No. 36211US1.

Respectfully submitted,
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